SPACE SCIENCE ADVISORY COMMITTEE

September 6, 2003

Dr. Edward Weiler
Associate Administrator for Space Science
NASA Headquarters
Washington, DC 20546

Dear Dr. Weiler,

The Space Science Advisory Committee (SScAC) met in public session August 11-13, 2003 at NASA headquarters. We welcomed Dr. David Deamer as a new member of the committee and Drs. Fiona Harrison and Andrew Klein as pending members. We had excellent attendance from the membership of the committee throughout the meeting. My thanks also to Marc Allen, Marian Norris and their staff for their leadership and efforts in support of a successful meeting.

The meeting was dominated by consideration of two important issues: the financial health of the Discovery program and in particular the MESSENGER mission. It was of great interest to the committee and, based on the number in the gallery, to external observers as well. An evaluation of progress in Space Science in terms of the GPRA (Government Performance and Results Act) dominated the second day of our meeting, but despite the mandatory aspects of the review, it was satisfying to contemplate the outstanding science progress we are witnessing in the Office of Space Science missions.

In addition we were pleased to hear from members of your staff and others within the NASA organization. We were grateful for their flexibility with regards to the agenda since there were more rearrangements than normal. The committee was impressed with the informative, concise and insightful briefings that were brought before us by Colleen Hartman, Anne Kinney, Richard Fisher, Al Newhouse, Orlando Figueroa, Ray Taylor, Jay Bergstralh, and Dennis Andrucyk. We apologize for our inability to accommodate Dr. Paul Hertz's oral presentation but found copies of his charts very useful.

We were delighted to hear outstanding science presentations during our noon hour each day. Dr Mauro Giavalisco, Space Telescope Science Institute, addressed the topic of the origins deep survey and the search for high-redshift supernovae. He described research to address fundamental question regarding the origins of galaxies, black holes and the dynamics of the cosmic expansion. Dr Robert Pfaff, NASA/GSFC, reviewed the science results and future possibilities involving the NASA sounding rocket program. Despite the acknowledged value of the program, there are issues regarding the health and

capabilities of the rocket program and the full sub-orbital program that will continue to draw the attention of SScAC.

Following our meeting we learned that Dr. Colleen Hartman, Director of the Solar System Exploration Division, announced her plan to vacate her post at NASA effective September 22. The SScAC wishes to express its heart-felt appreciation for her service to our community. She has skillfully led the division through a very exciting time of scientific exploration and has formulated programs and missions that will impact the science for years to come. We will, of course, miss her but at the same time wish her all the best in her new adventure.

I recused myself during the presentations and discussion of the Prometheus Project, therefore a separate letter summarizing the committee discussion will be submitted to you by David McComas, chair of SECAS, who led the committee in my absence. The record should also show that Dr. Charles Beichman recused himself during the discussion on science centers. Specific comments on other items and recommendations follow.

Messenger

The SSAC endorses the SSES recommendation NOT to cancel the Mercury Messenger mission despite its recent cost growth above its cost cap. We urge NASA to be especially vigilant through the completion of Messenger's Thermal Vacuum test in particular to ensure that the remainder of the development of Messenger proceeds smoothly to a launch no later than August 2004. **If such progress cannot be assured, then SScAC recommends that NASA consider terminating the Messenger program**.

We adopt this recommendation on the basis of the strong scientific case for the project articulated by SSES. Also the briefings by the PI, Dr Sean Solomon, and Dr. Colleen Hartman suggested that Messenger has an excellent likelihood of making a May 2004, or at latest an August 2004, launch date. The committee recognizes that the additional costs incurred by MESSENGER will delay the release of the Announcement of Opportunity for the next Discovery mission.

The level of reserves initially proposed by Messenger and accepted by NASA appears in hindsight to have been unreasonably low for an extremely challenging mission. **SScAC endorses the new policy of requiring at least a 25 percent reserve for Discovery missions, based on the need to balance scientific return and program risk.**

There were a number of early warning signs that Messenger was in trouble, including significant underspending early in the program (indicative of slow technical progress), difficulty in staffing up, and departure of key project personnel. Early identification of these problems could have resulted in timely intervention or invoking descope options that might have saved significant resources

In terms of the overall Discovery selection and development process, the committee has the following recommendations intended to enhance the likelihood of successful

outcomes for Discovery (and other missions). The committee notes that other NASA missions may also benefit from consideration of these ideas.

- **SScAC recommends that NASA develop a formal process for collecting the lessons learned from problems in both PI-led and in-house NASA missions, and for incorporating this knowledge into the acquisition/development process to help avoid recurrence of these problems on future missions.** Each step in the creation of a new mission including the AO process, the evaluation process, the selection process, the funding process, and so forth should be examined for process improvement. The SScAC would like to have further briefings from PIs and NASA officials to expand its understanding of project management and development.

- **SScAC recommends that NASA incorporate to a greater extent the TMCO results into the science review process.** Having such knowledge could help the evaluating scientists weigh the risks of a given project against its promise. The SScAC felt that this was a very important issue. Having extensive experience in the proposal review process, the committee felt that better insight into the technical and costs risks would be valuable for arriving at more balanced science ratings for proposed investigations. We also realize that there is no simple approach for all situations, but regard the issue deserving of serious consideration.

- **SScAC recommends that NASA should increase the depth, duration and funding of the Step 2 process, possibly by deferring the final down selection of the missions to be selected for flight until the confirmation review.** This approach puts more upfront costs into the Discovery program, but could reduce the cost and schedule risk inherent in selecting projects that have not been studied to an appropriate depth. After a mission has entered Phase C/D, descope options usually are not effective in reducing overall cost, therefore greater emphasis on the early definition stages will give greater flexibility in the exercise of descope options.

- **SScAC recommends that NASA assess all existing Discovery programs for adequacy of reserves.**

Science Centers

The committee is very concerned about the trend toward non-competed science centers for major NASA missions (e.g., SIM, LBTI, and JWST). Competition will produce strong centers at lower cost to NASA.

The OS was informed that an open competition would have a severe programmatic impact on SIM but some subcommittee members were not convinced of this. Because TPF is still in its architectural definition phase, we encourage an open competition for its science center, as for all upcoming major science centers **The SScAC requests a presentation on OSS policy for competing science centers.**

The Future of HST

SScAC discussed some of the options for the future of the Hubble Space Telescope. However, at the time of the meeting, several key reports had not been released, including the report from the "blue ribbon" committee led by John Bahcall on the HST/JWST transition, and more importantly, the report from the Columbia Accident Investigating Board (CAIB). As pointed out both at the SScAC meeting and in the subsequently-released Bahcall Committee Report, any future plans for HST will depend critically on the Space Shuttle program. **SScAC will need to revisit this topic at its next meeting, by which time the CAIB report should be made public and some understanding of realistic options should be known.**

Explorer Mission SMEX vs. MIDEX Mix

The Explorer program comprising a mix of mid-sized (MIDEX) missions, capped at $180M, and small (SMEX) missions, capped at $120M, plus missions of opportunity is regarded widely as having been highly successful. Because of the value of this program to space science, SScAC became very concerned when it learned of 1) possible future problems of securing appropriate launch services for these missions 2) possible future decline in the compelling science in the SMEX category and 3) the possibility of adjusting the flight rate and raising the cost cap on the MIDEX missions. Therefore we asked the sub-committees to consider whether changes in the mix of missions in the Explorer program were warranted.

The OS and SEUS met in joint session to review the Explorer situation. The SECAS did not have a formal meeting so responses were received via e-mail. The sub-committees stressed the critical importance of frequent access to space for ensuring scientific progress and for training our future scientists. Frequent access to space, the relatively short development cycle and the excellent science were all cited as strengths of the program**. SScAC endorses the recommendation of all committees that the present mix of 2 SMEXs and 2 MIDEXs missions every three years be maintained.**

Thanks again for the opportunity to work with you in service to NASA. We all appreciate the opportunity to engage in conversation with you and discuss issues of importance to space science.

Sincerely

Andrew B. Christensen
SScAC Chair

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6220 CULEBRA RD. 78238-5166 • P.O. DRAWER 28510 78228-0510 • SAN ANTONIO, TEXAS, USA • (210) 684-5111 • WWW.SWRI.ORG

SPACE SCIENCE AND ENGINEERING DIVISION

August 27, 2003

Dr. Edward Weiler
NASA Headquarters
Code S
300 E Street SW
Washington, DC 20546-0001

Dear Dr. Weiler:

Because of the perception of a potential conflict of interest for the Space Science Advisory Committee (SScAC) Chairman, Dr. Andy Christiansen, he recused himself from all discussions of the nuclear initiative at our last SScAC meeting. As Acting Chair for those briefings and discussion, I am forwarding the findings of our Committee along to you on the topics of Project Prometheus and the Jupiter Icy Moons Orbiter (JIMO).

Project Prometheus

As stated in our previous letter, the SScAC recognizes that Project Prometheus and JIMO offer significant, and potentially revolutionary, opportunities for space science. In the same letter, we recommended that Code S aggressively engage the *broad* space science community in exploring the opportunities provided by this new program, in order to identify missions in *all thematic areas* that would benefit from these developing technologies. Now that Project Prometheus has a Science Concept Definition Team (SCDT) in place, we urge that the membership be expanded to include scientists with interests in SEC, OS, and SEUS scientific areas. We request that the Prometheus SCDT report to us at our next meeting on the team's membership, its science plan, and its interface with Project Prometheus.

JIMO

If successful, JIMO has the capability to address the main science objectives for Europa as presented in the NRC decadal survey. JIMO also can accomplish, within the same mission envelope, significant science objectives for Ganymede and Callisto that were not anticipated by the NRC committee. The science community is clearly enthused by JIMO, as evidenced by the well-attended JIMO forum held in Houston in June 2003. We are, nonetheless, concerned about the degree of coordination between the technology development efforts within Project Prometheus and the JIMO science definition and advisory activities. We recommend that there be stronger interactions between Project Prometheus leadership and the JIMO science groups to ensure that Project Prometheus maintains its focus on enabling a new generation of high value missions of scientific

exploration, and that JIMO, in particular, remains a science-driven effort. We request that the JIMO Science Definition Team report to us at our next SScAC meeting on a detailed assessment of JIMO science goals and how Project Prometheus is structured to attain them.

On behalf of the entire Space Science Advisory Committee I thank you again for the opportunity to review these important elements of the Office of Space Science portfolio and hope that you will find our advice helpful in optimizing the scientific productivity from these important programs.

Sincerely,

David J. McComas, Acting Chairman
Space Science Advisory Committee

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cc: SScAC Members